Duwamish Coalition
King County Office of Budget and Strategic Planning

Industrial Companies in the Duwamish Corridor:

Opportunities for Waste Exchange

Final Report

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(Internet Version - April 1998)

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NOTICE

This version of the report was reconstructed by EPA Region 10 in January 1998, using the best available electronic pieces of the original hard copy. Due to missing components, differences in word processing software, and other factors, some of the original format has been lost. This includes page numbers, section and subsection numbers and some of the attachments. Any missing components have been annotated as such and sometimes replaced with the best available current information. Due to the amount of time it would take to clean-up formatting problems, it was determined not time/cost effective to correct these. The intent is to make the core information from this report available to the widest audience possible, electronically via the Internet. (John Dumas, EPA Region 10, April 1998)

Acknowledgments

In 1995, the Environmental Protection Agency (EPA), Region 10, granted $20,000 to King County to conduct an Industrial Ecology Study of the Duwamish Industrial Corridor. King County matched the grant with $5,000 and contracted with Cascadia Consulting, Inc. to conduct the study.

King County wishes to thank EPA for funding the study and supporting the project throughout its development. In particular the County wishes to acknowledge the involvement of Nancy Helm, EPA Waste Minimization Coordinator and grant program manager; Gary O'Neal, former Director, EPA Environmental Sustainability Program; and Jim Werntz, current Director, EPA Sustainable Communities Program.

We also wish to thank several other individuals who assisted in reviewing consultant proposals and in choosing the final consultant team. These included Michael Alvine, King County Economic Development Program; Alice Chapman, King County Hazardous Waste Management Program; Preston Horne-Brine, Washington State Clean Washington Center; and Bill Lawrence, Seattle/King County Health Department Industrial Materials Exchange Program.

In addition, Preston Horne-Brine and Bill Lawrence served on the project's oversight committee and contributed many hours of time and expert advice. Their input was invaluable to the success of the project.

Table of Contents

(Page numbers will not always correspond in this electronic version. See NOTICE above.)

Tables

(Page numbers will not always correspond in this electronic version. See NOTICE above.)

Figures

Executive Summary

Background

Waste exchange systems promote ecologically sound industry and produce immediate economic benefits to participating businesses. The Seattle-King County Industrial Materials Exchange (IMEX) documented 279 successful waste exchanges involving King County businesses in 1996. These local businesses saved more than $600,000 in purchasing and disposal costs and diverted tons of material from the landfill.

As part of its mission to protect and enhance the natural environment in the Duwamish corridor, as well as expand the manufacturing and industrial job base, the Duwamish Coalition and King County commissioned this study to facilitate industrial waste exchanges in the Duwamish corridor. The corridor is home to King County's largest concentration of industrial businesses and includes all of the land bordering the Duwamish River and extending along part of Elliot Bay. Its approximate borders are Jackson Street to the north, Interstate 5 to the east, Interstate 405 to the south and Marginal Way to the west.

The project consisted of three main tasks:

- Researching other materials exchange programs operating across North America.
- Searching existing databases for wastes listed as wanted or available by Duwamish industries.
- Surveying industrial firms located in the Duwamish corridor and recording the by-products and feedstocks they are willing to trade.

The survey instrument consisted of:

- A cover letter signed by King County Executive Gary Locke and King County Council member Kent Pullen; both served as Co-Chairs of the Duwamish Coalition.
- A few short questions about the business itself, followed by instructions and an example of how to fill out the materials listing form.
- The materials listing form, which included enough space for nine separate items.

A mailing list of all Duwamish businesses was purchased from NameFinders, Inc. According to this source, there are 412 industrial firms located in the Duwamish corridor. The survey was sent to each of these businesses and followed with phone calls, resulting in a 72% response rate.

Findings

- During the phone survey, interviewers found it necessary to define "waste exchange" for many of the businesspeople; few were familiar with the concept. Other businesses, however, not only knew about the idea of waste exchange but had actually participated (either formally or informally) in a previous exchange (6% of the respondents).
- Of the companies without waste exchange experience, approximately 33% were at least somewhat interested in participating ("yes" and "maybe" responses).
- About 24% of the respondents (70 businesses) listed a total of 117 materials in the waste-matching survey.
  - 13 companies listed "wanted" materials.
  - 53 companies listed "available" materials.
  - 4 companies listed both wanted and available materials.
- Businesspeople were especially reluctant to list hazardous materials as possible exchange items. They were concerned that exchange would not be a safe or legally acceptable method of handling these materials. Liability regarding the future disposal of these products was also a source of worry.
- About 27% of the respondents were willing to list at least one "available" by-product or waste material. Companies were most likely to list materials that:
  - Were generated on a regular basis.
  - The respondent had not been able to recycle.
  - The respondent felt could still be of use to another company.
- There are tentative opportunities for 47 companies (about 67% of the participating businesses) to exchange at least one of their listed materials within the Duwamish corridor. Several other potential matches were identified by reviewing IMEX listings.
- Many of the Duwamish companies listed common recyclables as available for exchange. This supply of materials represents opportunities both for existing recycling companies and new ventures.
- A total of 543 Duwamish businesses (both industrial and non-industrial) are on the IMEX mailing list. Since the inception of IMEX in 1989, about 90 Duwamish businesses have listed an ad in the catalog.

Recommended Next Steps

Suggestions for the future are grouped into three categories:

- Following up with survey participants.
- Facilitating waste exchange (in the Duwamish corridor and elsewhere).
- Planning for small-scale waste exchange programs.

Following Up with Participants

Among the recommended next steps, first priority should be given to simply following up with the participants.

- A number of potential matches were identified within the corridor and with IMEX listings. King County should contact these businesses and help coordinate materials exchanges.
- People were unfamiliar with the Duwamish Coalition's name and purpose. As a first step, the County should send information to all the businesses specifically requesting it. Furthermore, the County may want to publicize the Coalition's ongoing projects more broadly, through newspaper/newsletter articles and other media.
- Several businesses listed common recyclables—such as cardboard, paper, wood and metal scrap—as materials they had available for exchange. These companies should be referred to recycling service providers.
- A few businesses requested general waste management advice. These companies should be connected with the new Environmental Extension Service (EES) coordinated by the Environmental Coalition of South Seattle or one of the other technical assistance projects sponsored by King County, Seattle, Tukwila or Renton.
- A few businesses were eager to share their expertise in waste exchange, recycling and other waste diversion efforts. King County (and/or the EES) could gain additional insight by contacting these firms. In addition, these companies should be encouraged to apply for Green Works, the County's business recycling recognition program.

Facilitating Waste Exchange

Although these recommendations directly address the Duwamish findings, the suggestions could also be applied to other waste exchange programs.

Publicize Waste Exchange Opportunities

The majority (94%) of surveyed business had never participated in a waste exchange; in fact, many of the respondents did not know what the term "waste exchange" means. Before businesses can be expected to set up waste exchanges, they must understand how these arrangements work.

- King County should actively publicize waste exchange success stories and describe the steps involved to set up and maintain the agreements. Although it would be particularly good to spotlight Duwamish businesses, information about exchanges located in other areas would also be useful. Local advertising, such as newsletter articles or brochures mailed to Duwamish companies, could be combined with a promotional campaign co-sponsored by other jurisdictions and targeting the entire Puget Sound region.

- Encourage businesses to use IMEX. The County could send a promotional packet about IMEX to all businesses in the corridor, not just the 412 industrial firms surveyed.
- The survey uncovered one non-profit firm willing to accept a wide variety of materials; there are many similar organizations listed in the IMEX catalog. King County may want to promote local educational and charitable programs that accept used items. Such an arrangement may not be industrial waste exchange per se, but it would divert materials from the waste stream.

Address Barriers

Aside from a general lack of familiarity with the concept, the respondents provided several reasons why they were reluctant to participate in a waste exchange. King County should spend some time exploring possible solutions to the following barriers:

- Concerns about the legality and safety of exchanging hazardous products.
- Fears that recycled/previously used materials do not meet performance requirements.
- Beliefs that one company's waste could not possibly be valuable to another firm; if the material was not one traditionally recycled, it was considered worthless.
- Worries that the time commitments involved with waste exchange would be prohibitive.

Solicit Industry Input

A few businesses were eager to share their expertise in waste exchange, recycling and other waste diversion efforts. These companies may have practical, hands-on advice the County could pass along to other firms considering waste exchange. In addition, these exemplary companies may offer solutions to the barriers listed above.

- Conduct in-depth interviews and focus groups with companies having a history of successful waste exchange.
- Encourage networking among businesses in the corridor. For instance, the County could sponsor a roundtable discussion about waste exchange with representatives from a number of industries. Or, the County could team with businesspeople having prior waste exchange experience and visit companies without that expertise.

Planning for Small-Scale Waste Exchange Programs

Lessons learned while conducting the Duwamish survey can also be applied to other similar programs. Suggestions for future efforts are discussed below.

Coordinate with IMEX

The most important recommendation is to strengthen the ties with IMEX. Similar surveys, even if funded by a separate organization such as the Duwamish Coalition, should be an outgrowth of IMEX. The survey should clearly ask whether information gathered may be listed in the IMEX catalog. Small-scale projects are helpful as a means of focusing the effort, but the probability of successful material matching is greatly improved by linking with businesses throughout the Pacific Northwest.

Follow-up Efforts

The survey, which gathered information about the by-products and feedstocks companies want to trade, is only a first step in the overall effort to facilitate waste exchange. As much time could easily be budgeted to follow-up tasks (such as helping negotiate exchange agreements) as to the task of planning and conducting the survey.

In addition, the survey uncovered a great deal of information that would be of interest to other local agencies. Respondents also expressed a need for technical assistance in areas other than waste exchange. Future projects could combine efforts with other agencies so that the survey and follow-up work could target not only exchange items, but also hazardous, recyclable, compostable and other wastes as well.

Fine-tuning the Survey

Although the survey was quite successful, there is always room for improvement. Suggestions include:

- The project's high response rate is due to the follow-up phone calls, rather than the mail survey. In the future, it might be useful to consider the mailing as only a means of acquainting businesses with the concept of waste exchange, then relying nearly exclusively on phone calls for conducting the actual survey. For instance, the introductory mailing could more completely define the concept of waste exchange, provide more examples of successful exchanges, and include a few pages from the IMEX catalog listings.
- The respondents should be encouraged to be as specific as possible in their listings. It is difficult to identify true matches for companies wanting "miscellaneous material for fabrication."
- As mentioned previously, future studies should be as closely coordinated with IMEX as possible. It is recommended that the data gathered match the format used by IMEX (same category names, database fields, etc.).

Alternative Methodologies

Another means of identifying businesses' by-products and feedstocks is to conduct on-site evaluations. This method is much more time-consuming, but it also has the potential for a bigger impact. In addition, by actually examining the company's dumpster, more information would be collected from the businesses that indicated they had "no waste."

The Duwamish survey focused on industrial firms only. However, all types of businesses use the IMEX catalog. It might be useful to include all the companies in a particular neighborhood, rather than just the industrial ones, when conducting a small-scale waste exchange effort.

A third alternative is to focus on a specific industry type rather than a particular location. A great deal of information about the targeted industry's inputs and outputs could be gathered.

Introduction

Project Purpose

As part of its mission to protect and enhance the natural environment in the Duwamish corridor, as well as expand the manufacturing and industrial job base, the Duwamish Coalition and King County commissioned this study to facilitate industrial waste exchanges in the Duwamish industrial corridor. The project consisted of three main tasks:

- Researching other materials exchange programs operating across North America.
- Searching existing databases for wastes listed as wanted or available by Duwamish industries.
- Surveying industrial firms located in the Duwamish corridor and recording the by-products and feedstocks they are willing to trade.

Overview of Methodology

This section briefly describes the project's methodology. For more detail, please refer to the appendices.

Research

Prior to conducting the survey, other materials exchange programs were researched. A total of 55 programs were identified; catalogs from 16 of these exchanges were reviewed. Of particular interest were the material categories each program used to organize the various listings. This task resulted in developing a list of 17 categories for the Duwamish project;[1] the first 13 classifications are identical to those used by the Seattle-King County Industrial Materials Exchange (IMEX).[2]

1. Acid
2. Alkali
3. Other Inorganic Chemicals
4. Solvent
5. Other Organic Chemicals
6. Laboratory Chemicals
7. Plastic & Rubber
8. Textile & Leather
9. Metal & Metal Sludge
10. Oil & Wax
11. Industrial & Other Equipment
12. Wood & Paper
13. Miscellaneous Material
14. Glass
15. Paint & Coating
16. Construction Debris
17. Container & Pallet

[1] However, none of the surveyed Duwamish businesses listed materials (either wanted or available) in the acid, alkali, construction debris, laboratory chemicals, other organic chemicals or other inorganic chemicals categories.

[2] The Seattle-King County Industrial Materials Exchange program (IMEX) has been in operation for 7 years. Nationally recognized as one of the best waste exchange networks, IMEX distributes catalogs to nearly 9,500 businesses on a bi-monthly basis.

In addition, a search was conducted for existing data regarding Duwamish firms' feedstocks and waste. Data from IMEX and the Washington Department of Ecology's Hazardous Waste and Toxics Reduction Program were reviewed.

Staff from three local agencies (IMEX, the Clean Washington Center and the King County Commission for Marketing Recyclable Materials) and one non-profit organization (the Environmental Coalition of South Seattle, or ECOSS) were interviewed in order to solicit advice about the survey, obtain information about local industrial wastes, and gauge their willingness to help facilitate Duwamish waste exchanges. Each staff person expressed a strong interest in the project and suggested means by which their organizations could participate. (A summary of opportunities for collaboration is presented in Appendix F.)

Conducting the Survey

The survey instrument consisted of:

- A cover letter signed by King County Executive Gary Locke and King County Council member Kent Pullen; both served as Co-Chairs of the Duwamish Coalition.
- A few short questions about the business itself, followed by instructions and an example of how to fill out the materials listing form.
- The materials listing form, which included enough space for nine separate items.

The survey was pre-tested in November, using a list of 25 businesses provided by ECOSS. Twelve of these companies provided feedback, all of which was positive about the project in general and the survey instrument itself. (Copies of the cover letters and survey forms are included in Appendix B.)

A mailing list of all Duwamish businesses was purchased from NameFinders, Inc. According to this source, there are 412 industrial firms located in the Duwamish corridor. The survey was sent to each of these businesses. The first mailing was conducted in early December; a second mailing was sent to non-respondents in early January. This sequence was designed to provide sufficient time to respond, but not allow too much time to elapse between the initial and reminder mailing. Whenever a survey was returned with an address correction, it was mailed to the updated address.

Follow-up phone calls to non-respondents were made during the month of February. The phone interviews gave both the interviewer and business owner the opportunity for dialogue. Interviewers were able to completely explain the concept of waste exchange to those businesspeople unfamiliar with the concept. In addition, the conversations resulted in obtaining more detailed information about the company than was possible through the mail survey. The final response rate was 72%.

Information recorded during the survey was entered into a Microsoft Access database that was customized for the project. The database is configured to search for matches between "available" and "wanted" materials.

Follow-Up Mailing

A brief follow-up memo was mailed to all 412 industrial firms in the Duwamish corridor. The purposes of the mailing were to:

- Share results of the survey.
- Follow up with those businesses asking for recycling assistance.
- Publicize the Environmental Extension Service, a new resource available to Duwamish businesses.

The memo briefly outlined the survey findings, described the free services provided by IMEX and the Environmental Extension Service, and listed phone numbers for local technical assistance programs and recycling service providers. (A copy of the memo is included in Appendix B.)

Description of Duwamish Businesses

The Duwamish corridor is home to King County's largest concentration of industrial businesses, and includes all of the land bordering the Duwamish River and extending along part of Elliot Bay. As displayed in Map A, its approximate borders are Jackson Street to the north, Interstate 5 to the east, Interstate 405 to the south and Marginal Way to the west.

According to the mailing list purchased from NameFinders, 412 of the 3,225 companies located in the Duwamish corridor are industrial firms. The survey was mailed to all 412 Duwamish industrial businesses. As shown in Table 2-1, 72% responded to the survey.

Table 0-1 Survey Response Rates

	Business Count	
Mailed Response	55	13%
Phone Response	241	58%
Overall Response Rate	**296**	**72%**
Returned as Unforwardable/Phone Disconnected	33	8%
No Response	83	20%
Total Surveys	**412**	**100%**

Map A: Duwamish Industrial Corridor

Can be found at:

http://www.ci.seattle.wa.us/business/dc/map/dcjuris.jpg

Industry Type

The purchased list contains the Standard Industrial Code for each company in the Duwamish corridor. Table 2-2 presents the industry description of the surveyed businesses. As shown, heavy equipment, metal products and printers account for slightly more than half (52%) of the industrial firms in the Duwamish corridor; these industry types also account for half of the survey responses.

Table 0-2 Number of Surveyed Businesses, by Industry Type

	Business Count			
Industry Description	*Duwamish Corridor*		*Survey Respondents*	
Apparel Manufacturing	18	4.4%	14	4.7%
Ceramic & Brick Manufacturing	12	2.9%	8	2.7%
Chemical Manufacturing	10	2.4%	6	2.0%
Electronics	16	3.9%	11	3.7%
Food Processing	24	5.8%	11	3.7%
Furniture Manufacturing	9	2.2%	7	2.4%
Furniture Wholesale	1	0.2%	1	0.3%
Heavy Equipment	92	22.3%	65	22.0%
Laboratory/Measurement Instruments	3	0.7%	2	0.7%
Leather Goods Manufacturing	1	0.2%	0	0.0%
Metal Products	61	14.8%	49	16.6%
Metal Works	23	5.6%	20	6.8%
Packaging Manufacturing	18	4.4%	16	5.4%
Plastics Manufacturing	19	4.6%	11	3.7%
Precious Metals	24	5.8%	17	5.7%
Printer	60	14.6%	40	13.5%
Textile Manufacturers	1	0.2%	1	0.3%
Vehicles	14	3.4%	11	3.7%
Wholesale Trade	1	0.2%	1	0.3%
Wood Working	5	1.2%	5	1.7%
Total Duwamish Industrial Firms	**412**	**100.0%**	**296**	**100.0%**

Duwamish Coalition Membership

About 4% of the respondents are members of the Duwamish Coalition. Non-members were asked if they would like additional information about the Coalition; slightly less than half (43%) were interested. Results are listed in Table 2-3.

Table 0-3 Surveyed Businesses' Membership and Interest in the Duwamish Coalition

	Number of	
Currently a Duwamish Coalition Member?	**Businesses**	
Yes	13	4%
No	283	96%
Total	**296**	**100%**
If No, Would you like more information about the Duwamish Coalition?		
Yes	122	43%
No	161	57%

Materials Exchange Interest/Usage

During the phone survey, interviewers found it necessary to define ”waste exchange” for many of the businesspeople; few were familiar with the concept. Other businesses, however, not only knew about the idea of waste exchange but had actually participated (either formally or informally) in a previous exchange (about 6% of the respondents).

After the businesspeople were given an overview of how waste exchange generally works, they were asked if they were interested in participating. Of the companies without waste exchange experience, approximately 33% were at least somewhat interested (“yes” and “maybe” responses). In addition, many of the businesses that indicated they were not interested went on to explain that they were not opposed to participating, but they simply did not have any materials to list.

Detailed survey results are shown in Table 2-4. It should be noted that a response of “No interest” from those businesses with previous waste experience includes both dissatisfied businesses and those companies that are still continuing the exchange but have no need or interest to develop additional partnerships.

Table 0-4 Surveyed Businesses' Previous Usage and Current Interest in Waste Exchanges

Ever Participated in a Materials Exchange?	Interested in Materials Exchange?	Number of Businesses	
Yes			
	Yes	6	
	Maybe	1	
	No	8	
	No Response	3	
	Subtotal	**18**	**6%**
No			
	Yes	25	
	Maybe	67	
	No	182	
	No Response	4	
	Subtotal	**278**	**94%**
Total		**296**	**100%**

Non-industrial businesses in the Duwamish area may have more experience with waste exchanges. An analysis of IMEX records showed that 543 Duwamish businesses (about 17% of the estimated total of both industrial and non-industrial firms in the corridor) have either placed an IMEX ad or requested a copy of the catalog during the program’s seven-year history. (For more detail, please see Appendix D.)

Materials Summary

About 24% of the respondents (70 businesses) listed a total of 117 materials in the waste-matching survey.

- 13 companies listed "wanted" materials.
- 53 companies listed "available" materials.
- 4 companies listed both wanted and available materials.

"Wanted" Materials

The survey collected information about the materials Duwamish businesses were interested in receiving. In addition, certain companies are required to report hazardous material usage to the Washington State Department of Ecology's (Ecology) Hazardous Waste and Toxics Reduction Program. Finally, businesses may place want ads with IMEX. Ecology and IMEX data were searched for information specific to the Duwamish corridor.

Survey Results

Businesses were less likely to list materials they could use (possible feedstocks, tools, etc.) than items they wanted to get rid of (by-products, overstocks, etc.). Several of the contacts said that recycled or used materials would not meet their requirements. However, only one of these respondents mentioned that their business had previously tried recycled products.

A number of companies indicated they would be willing to accept used materials, but did not have pressing needs. In addition, several respondents said they would prefer to scan the available materials listing to see if they could use anything, rather than place a specific want ad.

A summary of the wanted materials, by general material category and industry, is presented in Table 3-1. (The specific materials listed by each company are described in Section 4.) Two companies—a non-profit in the metal works industry and a printer—were willing to accept nearly any type of material. Combined, these two obliging businesses account for more than a third of the want ads.

Table 0-1 "Wanted" Materials, by Industry Type

"Wanted" Materials	Apparel Mfg	Ceramic & Brick Mfg	Chemical Mfg	Electronics	Food Processing	Furniture Mfg	Furniture Wholesale	Heavy Equipment	Lab/Measure Instruments	Metal Products	Metal Works	Pkg Mfg	Plastics Mfg	Precious Metals	Printer	Textile Mfg	Vehicles	Whsl Trade	Wood Work	Total	
Container & Pallets				1				1		2		1								**5**	**15%**
Glass		1									1									**2**	**6%**
Industrial & Otr Equipment								1			1									**2**	**6%**
Metal & Metal Sludge											3									**3**	**9%**
Miscellaneous Material								1			2				1					**4**	**12%**
Oil & Wax								1			1									**2**	**6%**
Paint & Coating								2			1				1					**4**	**12%**
Plastic & Rubber											1			1	1					**3**	**9%**
Solvent																				**0**	**0%**
Textile & Leather		1									1				2					**4**	**12%**
Wood & Paper								1			2	1			1					**5**	**15%**
Total Materials Listings	**0**	**2**	**0**	**1**	**0**	**0**	**0**	**7**	**0**	**2**	**13**	**2**	**0**	**1**	**6**	**0**	**0**	**0**	**0**	**34**	**100%**
Business Count	*0*	*1*	*0*	*1*	*0*	*0*	*0*	*4*	*0*	*1*	*4*	*2*	*0*	*1*	*3*	*0*	*0*	*0*	*0*	*17*	

Ecology Data

Ecology recently studied two industrial sectors of particular environmental concern statewide: fiberglass reinforced plastic (FRP) and electroplating. Ecology studied 39 FRP businesses in-depth; one of these is in the Duwamish corridor. In addition, Ecology studied 23 electroplating manufacturers; three are located in the Duwamish corridor. There are many other businesses, in a variety of SIC codes, that conduct plating as a portion of their manufacturing process ("captive shops"). The Duwamish corridor is likely home to several of these captive shops.

A total of 33 hazardous material inputs were identified in the FRP and electroplating sectors. These materials, some of which could potentially be included in a materials exchange, are listed in Table 3-2.

Table 0-2 FRP and Electroplating Sectors: Hazardous Material Inputs

Material Name	
1,1,1 TCA	MEK
ACETONE	NITRIC ACID
ADHESIVES	NON-CHLORINATED SOLVENTS
ALCOHOLS	PAINTS, STAINS
AMMONIA	POLYMER COATING
BLAST MEDIA	RESIN
CADMIUM	SODIUM HYDROXIDE
CHLORINATED SOLVENTS	SOLVENTS
CHROMIC ACID	STYRENE
CHROMIC ACID COMPOUNDS	SULFURIC ACID
COPPER	TCE
CYANIDE COMPOUNDS	THINNERS
EMULSIFIERS	TOLUENE
FOAMING AGENTS	WAX
HYDROCHLORIC ACID	XYLENE
INITIATORS/CATALYSTS	ZINC
LIME	

Industrial Materials Exchange Listings

In IMEX's history, 17 Duwamish businesses have placed a want ad.[3] It is likely that other Duwamish businesses have reviewed the IMEX catalog and found an item the company wanted; however, these data are very difficult to track. The catalog mailing list includes 543 Duwamish area businesses. (These figures include both industrial and non-industrial firms.)

The Duwamish businesses' IMEX want ads are summarized in Table 3-3.

Table 0-3 "Wanted" Materials Listed in the IMEX Catalog by Duwamish Businesses
(1989 to 1996)

Material Type	
Metal & Metal Sludge	**Other Organics**
COMPRESSORS	HALON 1211 AND 1301
ELECTRICAL POWER TRANSFORMERS	HALON 1301 & 1211
Plastics & Rubber	REFRIGERANT GAS
4 OR 5 GALLON PLASTIC BUCKETS WITH LIDS	**Miscellaneous**
BUBBLE CUSHIONING	BARRELS, 16 GALLON
PLASTIC SCRAP	COMPOSTABLE ORGANIC WASTE
PLASTICS	FUEL SOURCES, ALTERNATIVE
PVC FLEXIBLE FILM & PET SCRAP	GRIT, TRACTION
Textiles & Leather	LIGHTING FIXTURES
USED CLOTHING	METAL LIDS
Wood & Paper	TONER CARTRIDGES
PARTICLEBOARD & LAMINATED PARTICLEBOARD	

[3] Duwamish area businesses were identified by ZIP code.

"Available" Materials

Information about the by-products generated by Duwamish industrial firms was collected through the survey. In addition, at least two public agencies record industrial waste information; some Duwamish area businesses are included in these sources. Data from Ecology's Hazardous Waste and Toxics Reduction Program and IMEX were reviewed for information specific to the Duwamish corridor.

Survey Results

Several of the respondents indicated that their companies generated no waste. While the businesses may be very efficient, it is unlikely that they do not generate any waste at all. Therefore, the interviewers probed for more details. Common explanations are summarized below:

- The company generates metal scrap or cardboard and has long-standing recycling contracts. They doubted they could get a better deal selling/trading the material with another business.
- The company generates some solvent, ink or other hazardous material and sends it to a treatment facility. The respondents felt that the product was completely exhausted and would not be useful to another company. Businesspeople were especially reluctant to list hazardous materials as possible exchange items. They were concerned that exchange would not be a safe or legally acceptable method of handling these materials. Liability regarding the future disposal of these products was also a source of worry.
- Particularly in companies with existing recycling and/or re-use programs, the respondents saw no potential use for the remaining waste they did generate.

In addition, a few respondents were concerned about the amount of time required to set up an exchange and were uncertain how it could be arranged. One company believed that because they generated specific materials in such small quantities, it would not be worth the hassle to divert the waste from the garbage, or another company's time to come pick it up. Another expressed concern about having someone come "pick through the scraps" rather than just collect it all, like a recycler or garbage company would.

About 27% of the respondents were willing to list at least one "available" by-product or waste material. Companies were most likely to list materials that:

- Were generated on a regular basis.
- The respondent had not been able to recycle.
- The respondent felt could still be of use to another company.

Results are summarized, by general waste category and industry type, in Table 3-4. (The specific materials listed by each company are described in Section 4.) As shown, "wood & paper" and "container & pallets" were the most frequently listed material categories. About half of the materials listed originated from the heavy equipment, metal products and printing industries; similarly, these business types comprise about half of the survey respondents.

Table 0-4 "Available" Materials, by Industry Type

"Available" Materials	Apparel Mfg	Ceramic & Brick Mfg	Chemical Mfg	Electronics	Food Processing	Furniture Mfg	Furniture Wholesale	Heavy Equipment	Lab/Measure Instruments	Metal Products	Metal Works	Pkg Mfg	Plastics Mfg	Precious Metals	Printer	Textile Mfg	Vehicles	Whsl Trade	Wood Work	Total	
Container & Pallets	1				1			2		3	1	2			2		1			**13**	**16%**
Glass										1		1		1						**3**	**4%**
Industrial & Otr Equipment											3				1					**4**	**5%**
Metal & Metal Sludge								2		4			1							**7**	**8%**
Miscellaneous Material		1			3			1			2		2		1					**10**	**12%**
Oil & Wax								2			1									**3**	**4%**
Paint & Coating								2		3				1			1			**7**	**8%**
Plastic & Rubber												1	1	4			1			**7**	**8%**
Solvent										2					1					**3**	**4%**
Textile & Leather	2												1							**3**	**4%**
Wood & Paper	1				2	1		5				4		2	6		1		1	**23**	**28%**
Total Materials Listings	**4**	**1**	**0**	**0**	**6**	**1**	**0**	**14**	**0**	**13**	**7**	**8**	**5**	**8**	**11**	**0**	**4**	**0**	**1**	**83**	**100%**
Business Count	*4*	*1*	*0*	*0*	*5*	*1*	*0*	*7*	*0*	*9*	*4*	*5*	*4*	*5*	*8*	*0*	*3*	*0*	*1*	*57*	

Ecology Data

As described in Section 3.1.2, above, Ecology recently completed an in-depth study of the fiberglass reinforced plastic (FRP) and electroplating industries. Some of these businesses are located in the Duwamish corridor. As shown in Table 3-5, hazardous waste products include materials that are contaminated during the manufacturing process, such as rags and rinse water, as well as residual and spent quantities of the hazardous feedstocks. Some of these materials may be useful for other applications and thus could be traded through a waste exchange program.

Table 0-5 FRP and Electroplating Sectors: Hazardous Wastes

Waste Material Name	
OVERSPRAY SOLIDS, TRIM-ENDS/CUT-OUTS	RAGS
SPENT FILTERS	RINSE WATER
STILL BOTTOMS	SLUDGE
Spent or Out-Dated Quantities	
1,1,1 TCA	MEK
ACETONE	NITRIC ACID
ADHESIVES	NON-CHLORINATED SOLVENTS
ALCOHOLS	PAINTS, STAINS
AMMONIA	POLYMER COATING
BLAST MEDIA	RESIN
CADMIUM	SODIUM HYDROXIDE
CHLORINATED SOLVENTS	SOLVENTS
CHROMIC ACID	STYRENE
CHROMIC ACID COMPOUNDS	SULFURIC ACID
COPPER	TCE
CYANIDE COMPOUNDS	THINNERS
EMULSIFIERS	TOLUENE
FOAMING AGENTS	WAX
HYDROCHLORIC ACID	XYLENE
INITIATORS/CATALYSTS	ZINC
LIME	

Industrial Materials Exchange Listings

In seven years of IMEX operation, 80 Duwamish businesses (both industrial and non-industrial) have listed available materials in the exchange catalog. Table 3-6 summarizes the materials.

Potential Waste Matches

Potential material matches were identified among the Duwamish survey participants and the IMEX listings. The IMEX catalog contains ads from companies throughout the Northwest and across the nation. Even somewhat weak links between businesses' listings were marked as possibilities. Rather than miss any opportunities, it was decided to err on the side of optimism. Follow-up contact with the identified companies would weed out many of the potential matches (including some that may now appear to be a very good fit).

Some combinations are quite straightforward. For instance, one Duwamish business is looking for sawdust and two other Duwamish businesses are trying to get rid of it. A few companies were less specific in their listings (for example, one non-profit indicated it would accept "any supplies"). This very generalized listing greatly increased the number of possible matches; however, when the non-profit contacts the other firms, it may discover that few of the potential exchanges are actually appropriate.

There are tentative opportunities for 47 companies (about 67% of the participating businesses) to exchange at least one of their listed materials within the Duwamish corridor. In addition, the search was opened to businesses beyond the Duwamish corridor by reviewing IMEX listings.[4]

Potential matches are detailed in Table 4-1. The left columns describe the specific materials; the center column lists a business identifier assigned during the study; and the right column notes the exchange opportunities. Listings in bold indicate a possible match within the Duwamish corridor, while IMEX opportunities are recorded in the regular typeface. (Due to space constraints, the text regarding matches does not necessarily line up with the description of the corresponding material.)

Potential matches were identified for a high percentage of the Duwamish listings. However, opportunities were not uncovered for the following items:

Wanted

- Glasses, mugs
- Solder alloys and dross
- Clay
- T-shirts

Available

- Wetlocks used for fish packing
- Wax paper liners/wrapping

[4] The online version of the IMEX catalog (updated on March 5, 1997) was used for this task.

Table 0-1 Detailed Summary of Available & Wanted Materials and Opportunities for Matches

Materials Listed	Business ID	Potential Opportunities
Container & Pallets		
13 Available		***Possible match for bags: Biz ID 2278 and 2286***
bags, poly	2278	
buckets, 4 gallon with lids	1341	***Possible match for pallets: available (8 listings); wanted (3 listings)***
buckets, plastic 2 and 5 gallon, some with lids	3027	
misc container/pallet	1058	IMEX ads W0702329, W0702017, W0703416 wanted plastic buckets
misc container/pallet	2417	possible match with Biz ID 1341, 3027
pallets	521	
pallets	1818	Several IMEX ads, wanted pallets
pallets	1862	possible match for the 8 available pallet listings
pallets, broken	707	
pallets, broken or unusable	440	Several IMEX ads, available pallets
pallets, junk	1048	possible match for Biz ID 2905, 1361, 2781
pallets, new 52" X 46"	443	
pallets, wood	1320	IMEX ad A0903499, available wooden spools
5 Wanted		possible match for Biz ID 1361
Bulk bags, burlap bags, paper bags, obsolete bags	2286	
pallets	2905	IMEX ad A1101637, available wire/cable spools
pallets	1361	possible match for Biz ID 1361
Pallets	2781	
wire/rope reels	1361	Several IMEX ads, available bags
Glass		possible match for Biz ID 2286
3 Available		***Possible match for misc. glass: available (3 listings), wanted Biz ID 842***
broken pieces of glass	2742	
glass mirror scrap cutoffs	1511	IMEX ad W1103403, wanted flat glass
misc glass	2417	possible match with Biz ID 2742, 2417
2 Wanted		
any supplies for art program/foundry	842	
glasses, mugs	1274	
Industrial & Other Equipment		
4 Available		***Possible matches: Biz ID 1938 available; Biz ID 842 and 1727 wanted***
large metal cutting shear	1938	
metal press (briquette boiler) for copper, alum, soft metals	1938	Several IMEX ads, wanted toner cartridges
wire stripper, for insulated copper, alum, lead cable	1938	possible match with Biz ID 1110
toner cartridges for copy machines	1110	
2 Wanted		
any supplies for art program/foundry	842	
Wood or metal working equipment	1727	

Table 4-1, continued Detailed Summary of Available & Wanted Materials and Opportunities for Matches

Materials Listed	Business ID	Potential Opportunities
Metal & Metal Sludge		
7 Available		***Possible match: available (7 listings); Biz ID 842 wanted***
Chips from machine tools; scrap metal	2978	
machine turnings	1451	Several IMEX ads, wanted metal scrap
scrap	2417	possible match with any/all of the available listings in this category
Scrap metals - hot roll, galvanized, plate	2843	
scrap steel	1614	
scrap steel	2718	
scrap, numerous metals--can't elaborate, it varies	2467	
3 Wanted		
any supplies for art program/foundry	842	
lead scrap, must be clean	1938	
solder alloys, solder dross	1938	
Miscellaneous Material		
10 Available		***Possible match for sand, depending on contamination***
Abrasive Blast media - sand with non-hazardous paint debris	1367	***Biz ID 1367 and 440 available; Biz ID 1402 wanted***
ceramic material 90% silica	440	
ceramic tile, other floorcoverings	2291	***Possible match for miscellaneous:***
crushed grape skins, seeds; some fresh, some fermented	1593	***available Biz ID 1367, 440, 2291, 2840, 676, 1735; wanted Biz ID 842***
Discontinued retail foods and seafoods	2736	
Fish trim, fins and scraps; frozen	2736	IMEX ad W1103131, wanted sandblast grit, foundry sand,
ink, uv and emulsion products that are just past their shelf date	676	petroleum-contaminated soils. Possible match with Biz ID 1367, 440, 2765
Inks, assorted water-based textile printing	1735	
Left-over concrete - must be used in a timely manner	2840	Several IMEX ads wanted various organics, animal feed, food waste
soil contaminated with hydrocarbons	2765	possible match with Biz ID 1593, 2736
4 Wanted		
good clay	2461	IMEX ad A1101419, available foundry sand
Misc. material for possible fabrication/printing	1915	possible match, depending on contamination with Biz ID 1402
any supplies for art program/foundry	842	
new silica sand	1402	
Oil & Wax		
3 Available		Several IMEX ads wanted oil
mixed grease, oil, sludge	2900	possible match with any/all available listings in this category
quench oil	2643	
used torque fluid and hydraulic oil	707	Several IMEX ads, available oil
2 Wanted		possible match with any/all wanted listings in this category
90 weight gear oil for greasing our tools	681	
any supplies for art program/foundry	842	

Utilization of Materials

Manufacturers often have no use for their own by-products and consider these materials to be wastes. Other companies, however, may be able to utilize the materials and consider these items valuable feedstocks. Waste exchange systems, like recycling, promote ecologically sound industry and produce immediate economic benefits to participating businesses.

Examples of Successful IMEX Exchanges

IMEX documented 279 successful waste exchanges involving King County businesses in 1996.[5] These local businesses saved more than $600,000 in purchasing and disposal costs and diverted tons of material from the landfill. Waste exchanges occur both on a continuous and one-time-only basis. Examples of IMEX success stories are described below.

Tim's Cascade Chips and Bellevue Square Mall
Prior to contacting IMEX, Tim's Cascade Chips discarded 20,000 plastic bags each month. Now, however, Bellevue Square Mall uses 10,000 of the bags each month as trash can liners. Bellevue Square saves about $700 per month in purchase costs, while Tim's Cascade Chips saves $160 per month in disposal costs. In addition, several other malls have begun to use the potato chip bags as trash can liners.

City of Issaquah and Shoreline School District
The City of Issaquah planned to develop an ECO Center using sustainable building practices. The City placed a "want ad" with IMEX for salvaged, recycled and non-toxic building materials which was answered by the Shoreline School District. The District provided doors, lockers, chairs, mirrors, cabinets, shelving and molding—saving the ECO Center about $5,500 in purchase costs.

Western Foundry and Planar Systems (both located in Portland, OR)
IMEX recently facilitated an agreement between a medical diagnostic equipment manufacturer and a foundry located within 10 miles of each other. Planar Systems generates 1,200 gallons of slightly contaminated isopropanol alcohol per year, which Western Foundry now uses to give a smooth finish to its castings. Annually, the exchange saves Planar Systems $8,000 in avoided disposal costs and Western Foundry $4,000 on the cost of the solvent.

Examples of Other Waste Utilization

Many industries use waste products for at least a portion of their feedstocks. For instance, paper and aluminum manufacturers process a mixture of virgin and recycled materials. In recent years, there has been a growth in the number of businesses that depend on "wastes" for their primary raw material. A selection of King County companies are described below.

Northwest Wood and Fiber Recovery
This firm has taken the traditional practice of collecting and chipping old wood products for paper pulp or hog fuel and turned it into a large-scale urban business. Just two years old, Northwest Wood and Fiber Recovery is already diverting an estimated 28,000 tons of wood from King County landfills. The company rents drop boxes to high-volume customers and charges a dump fee for other users. They accept crates, old pallets and other types of clean, untreated wood.

Paint Solutions
This company recycles waste latex paint and produces a product that, according to various quality testing measurements, is nearly identical to new paint. Currently available in five colors, plans are underway to purchase new equipment enabling Paint Solutions to offer additional colors. Because the Seattle location has been in operation

[5] IMEX confirmed the 279 King County exchanges. It is likely that additional, unreported, exchanges also occurred.

for less than a year, paint volumes are still small. The company also crushes the paint cans and sells them to a recycler.

Total Reclaim
This company processes refrigerators, air conditioners, compressors and other equipment containing chlorofluorocarbons (CFCs), then recycles every part: the CFCs, oils and metals are all separated and processed. Total Reclaim handles nearly one million pounds of scrap metal from King County sources. In addition, the buying and re-selling of CFCs is the company's fast-growing component.

Eco Lights
A new venture of the Total Reclaim company, this offshoot recycles light bulbs, including fluorescents and ballasts (with or without PCBs). Equipment separates the glass, aluminum and mercury phosphor powder, all of which are reclaimed. With the mercury extracted, the other materials are no longer considered hazardous. Since this business only recently began operations, firm tonnage estimates are not yet available. However, Eco Lights has a company goal of handling one million bulbs within the next year and expects one- to two-thirds of these to come from King County sources.

Business Recruitment

Many well-established businesses regularly utilize waste materials as feedstocks. By-products generated by Duwamish industries represent an opportunity both for these existing businesses to expand their service territory into the corridor and for the development of new ventures.

Because many of the Duwamish companies listed common recyclables as available for waste exchange, the names and phone numbers of local full-service and specialty recyclers were listed in the follow-up memo to survey participants. Inquiries from the Duwamish businesses may prompt some of the recyclers to more actively advertise their services in the corridor.

In an effort to divert more material from the local landfills through waste exchange and/or recycling, the following business types could be recruited to the Duwamish corridor:

Paper recycling

The Puget Sound area has well-established systems (including pick-up, transport, marketing, and manufacturing) for recycling corrugated cardboard and other papers. Even so, 11 of the surveyed businesses listed such materials as available.

Metal recycling

As with paper, the Puget Sound area has well established systems for pick-up, transport and marketing of scrap metals. Still, seven of the surveyed businesses listed metals as available.

Plastics recycling

Seven companies responding to the survey listed plastics by-products. Further evaluation of the types and quantities of plastics generated by Duwamish industries would be needed, but an opportunity may exist for a plastic products manufacturer who can utilize a mixed feedstock. Such operations exist in the Puget Sound area, making items ranging from plastic lumber to flower pots.

Specialty recyclers

Duwamish businesses generate a wide array of by-products which could be utilized by specialty recyclers. For example, the Puget Sound area is home to recyclers handling such diverse materials as fluorescent lights, computers, appliances and construction debris.

Pallet brokers

The industry types located in the Duwamish corridor generate considerable numbers of used and exhausted pallets. Ten of the 57 surveyed companies that had materials available included pallets in their response; four of the 17 that wanted materials were looking for pallets. Because of health, strength and other concerns, pallets considered

exhausted by one industry may still be useable in another. A business opportunity exists in the redistribution of pallets from business to business, according to the needs and constraints of each. Unusable and broken wood pallets could feed into wood recycling.

Wood recycling

Unusable wood pallets could supply considerable material for wood recycling. The wood-working industries in the Duwamish corridor also could be steady suppliers of sawdust and wood scraps. Estimates of the total supply available would need to be made to determine if the materials would best be taken to wood recycling operations outside of the Duwamish corridor or if an opportunity exists to establish such a facility to serve the corridor.

Organic composting

There may be an opportunity for an organic composting operation in the Duwamish corridor. This could be supplied by the 24 food processing industries in the corridor and might also utilize sawdust and mixed papers from other industries and businesses. The types of wastes listed by Duwamish businesses indicate that an in-vessel type of composting which could handle animal as well as vegetal materials would be most feasible; further study of the types and amounts of organic wastes available would need to be completed.

Recommended Next Steps

Suggestions for the future are grouped into three categories:

- Following up with survey participants.
- Facilitating waste exchange (in the Duwamish corridor and elsewhere).
- Planning for small-scale waste exchange programs.

Following Up with Participants

Among the recommended next steps, first priority should be given to simply following up with the participants.

- A number of potential matches were identified within the corridor and with IMEX listings. King County should contact these businesses and help coordinate materials exchanges.
- People were unfamiliar with the Duwamish Coalition's name and purpose. As a first step, the County should send information to all the businesses specifically requesting it. Furthermore, the County may want to publicize the Coalition's ongoing projects more broadly, through newspaper/newsletter articles and other media.
- Several businesses listed common recyclables—such as cardboard, paper, wood and metal scrap—as materials they had available for exchange. These companies should be referred to recycling service providers.
- A few businesses requested general waste management advice. These companies should be connected with the new Environmental Extension Service (EES) coordinated by the Environmental Coalition of South Seattle or one of the other technical assistance projects sponsored by King County, Seattle, Tukwila or Renton.
- A few businesses were eager to share their expertise in waste exchange, recycling and other waste diversion efforts. King County (and/or the EES) could gain additional insight by contacting these firms. In addition, these companies should be encouraged to apply for Green Works, the County's business recycling recognition program.

Facilitating Waste Exchange

Although these recommendations directly address the Duwamish findings, the suggestions could also be applied to other waste exchange programs.

Publicize Waste Exchange Opportunities

The majority (94%) of surveyed business had never participated in a waste exchange; in fact, many of the respondents did not know what the term "waste exchange" means. Before businesses can be expected to set up waste exchanges, they must understand how these arrangements work.

- King County should actively publicize waste exchange success stories and describe the steps involved to set up and maintain the agreements. Although it would be particularly good to spotlight Duwamish businesses, information about exchanges located in other areas would also be useful. Local advertising, such as newsletter articles or brochures mailed to Duwamish companies, could be combined with a promotional campaign co-sponsored by other jurisdictions and targeting the entire Puget Sound region.
- Encourage businesses to use IMEX. The County could send a promotional packet about IMEX to all businesses in the corridor, not just the 412 industrial firms surveyed.
- The survey uncovered one non-profit firm willing to accept a wide variety of materials; there are many similar organizations listed in the IMEX catalog. King County may want to promote local educational and charitable programs that accept used items. Such an arrangement may not be industrial waste exchange per se, but it would divert materials from the waste stream.

Address Barriers

Aside from a general lack of familiarity with the concept, the respondents provided several reasons why they were reluctant to participate in a waste exchange. King County should spend some time exploring possible solutions to the following barriers:

- Concerns about the legality and safety of exchanging hazardous products.
- Fears that recycled/previously used materials do not meet performance requirements.
- Beliefs that one company's waste could not possibly be valuable to another firm; if the material was not one traditionally recycled, it was considered worthless.
- Worries that the time commitments involved with waste exchange would be prohibitive.

Solicit Industry Input

A few businesses were eager to share their expertise in waste exchange, recycling and other waste diversion efforts. These companies may have practical, hands-on advice the County could pass along to other firms considering waste exchange. In addition, these exemplary companies may offer solutions to the barriers listed above.

- Conduct in-depth interviews and focus groups with companies having a history of successful waste exchange.
- Encourage networking among businesses in the corridor. For instance, the County could sponsor a roundtable discussion about waste exchange with representatives from a number of industries. Or, the County could team with businesspeople having prior waste exchange experience and visit companies without that expertise.

Planning for Small-Scale Waste Exchange Programs

Lessons learned while conducting the Duwamish survey can also be applied to other similar programs. Suggestions for future efforts are discussed below.

Coordinate with IMEX

The most important recommendation is to strengthen the ties with IMEX. Similar surveys, even if funded by a separate organization such as the Duwamish Coalition, should be an outgrowth of IMEX. The survey should clearly ask whether information gathered may be listed in the IMEX catalog. Small-scale projects are helpful as a means of focusing the effort, but the probability of successful material matching is greatly improved by linking with businesses throughout the Pacific Northwest.

Follow-up Efforts

The survey, which gathered information about the by-products and feedstocks companies want to trade, is only a first step in the overall effort to facilitate waste exchange. As much time could easily be budgeted to follow-up tasks (such as helping negotiate exchange agreements) as to the task of planning and conducting the survey.

In addition, the survey uncovered a great deal of information that would be of interest to other local agencies. Respondents also expressed a need for technical assistance in areas other than waste exchange. Future projects could combine efforts with other agencies so that the survey and follow-up work could target not only exchange items, but also hazardous, recyclable, compostable and other wastes as well.

Fine-tuning the Survey

Although the survey was quite successful, there is always room for improvement. Suggestions include:

- The project's high response rate is due to the follow-up phone calls, rather than the mail survey. In the future, it might be useful to consider the mailing as only a means of acquainting businesses with the concept of waste exchange, then relying nearly exclusively on phone calls for conducting the actual survey. For instance, the introductory mailing could more completely define the concept of waste exchange, provide more examples of successful exchanges, and include a few pages from the IMEX catalog listings.
- The respondents should be encouraged to be as specific as possible in their listings. It is difficult to identify true matches for companies wanting "miscellaneous material for fabrication."
- As mentioned previously, future studies should be as closely coordinated with IMEX as possible. It is recommended that the data gathered match the format used by IMEX (same category names, database fields, etc.).

Alternative Methodologies

Another means of identifying businesses' by-products and feedstocks is to conduct on-site evaluations. This method is much more time-consuming, but it also has the potential for a bigger impact. In addition, by actually examining the company's dumpster, more information would be collected from the businesses that indicated they had "no waste."

The Duwamish survey focused on industrial firms only. However, all types of businesses use the IMEX catalog. It might be useful to include all the companies in a particular neighborhood, rather than just the industrial ones, when conducting a small-scale waste exchange effort.

A third alternative is to focus on a specific industry type rather than a particular location. A great deal of information about the targeted industry's inputs and outputs could be gathered.